A GROUND COLD AEROSOL TRIAL OF OMS–33 AND OMS–1197 AGAINST *AEDES AEGYPTI* IN JAKARTA *

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ABSTRAK

Suatu uji coba lapangan penggunaan dua macam insektisida pekat, yaitu OMS–33 (propoxur) dan OMS–1197 (chlorphoxim), menggunakan Fontan R–12, telah dilakukan dalam suatu permukiman yang padat penduduknya di Kampung Ambon, Jakarta Timur. Rata-rata penggunaan OMS–33 sebanyak 16,5 ml per rumah atau 677 ml per ha. Rata-rata penggunaan OMS–1197 sebanyak 17,8 ml per rumah atau 600 ml per ha. Di daerah yang disemprot dengan OMS–33, kerapatan *Aedes aegypti* kembali seperti keadaan sebelum disemprot setelah 7 hari sejak saat penyemprotan. Di daerah yang disemprot dengan OMS–1197, nyamuk tidak berhasil ditemukan dalam waktu 10 hari sesudah penyemprotan dan kerapatan yang rendah berlangsung terus selama sebulan , saat diakhirinya penelitian ini.

INTRODUCTION

Ground and aerial applications of technical insecticides such as malathion or fenitrothion have been effectively carried out for control of *Aedes aegypti* when outbreaks of dengue fever or dengue haemorrhagic fever occured [1, 2, 3, 4, 5, 6]. As a part of the WHO Programme for the Evaluation and Testing of New Insecticides, a ground cold aerosol application against *Aedes aegypti* of OMS–33 and OMS–1197 was carried out in a congested town area of Jakarta, using Fontan R–12 during the months of October and November 1977.

INSECTICIDES USED

Two insecticides, i.e. OMS–33 (propoxur) and OMS–1197 (chlorphoxim) were used for the trial. The OMS–33 formulation contains 120 g/litre propoxur, while the OMS–1197 contains 200 g/litre chlorphoxim. It was suggested that for mosquito control by cold aerosol, OMS–33 be applied at a dosage rate of 60–100 g/ha and OMS–1197 at 100–150 g/ha. The application of 500 ml/ha is equivalent to 60 g/ha for propoxur, or 100 g/ha for chlorphoxim. In the present trial, the target dosage of the application was 500 ml/ha.

STUDY AREA

The study area was Kampung Ambon, a congested residential area in the eastern part of Jakarta. Kampung Ambon is divided into three sub-areas: Area A, Area B and Area C. Areas A and B were sprayed with OMS–33 and OMS–1197, respectively; while Area C served as untreated check. Each area was mapped

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* OMS–33 (propoxur, BAYGON^{R}) : Ortho-isopropoxyphenyl methylcarbamate.
OMS–1197 (chlorphoxim, BAYTHION^{R}) : Ortho-chlorophenylglyoxylonitrile oxim o–ester with O, O–diethyl phosphorothioate.
Both of OMS–33 and OMS–1197 were manufactured by BAYER.

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and the number of houses was counted, as shown below: Area A– 8.4 ha and 378 houses; Area B– 11.3 ha and 440 houses; and Area C–8.9 ha and 230 houses.

SPRAYING OPERATION

Spraying operation was carried out by three spray teams, each with one squad chief, and three members, provided with one Fontan R12. Spraying was done inside houses only, including nonresidential buildings like schools, mosques, etc. Fontan was operated from the front door (s) of each house, with the target duration of 30 seconds per ordinary residential house. The spraying time was adjusted according to the size of the house. Spraying was always made at full throttle of the machines, i.e. 21 ml to 30 ml per minute. One sprayman sprayed for 20 minutes, covering approximately 14 houses at one time. The spraying was made on 24 and 23 October in Area A with OMS–33; and on 26 and 27 October 1977 in Area B with OMS–1997.

During spraying, spraymen were protected with a cotton cap, rubber gloves, a gauze mask, goggles and rubber boots. Rubber gloves were also used in handling the insecticide concentrates. A 50 litre water tank and soap were made available at the central part of the spraying area, and the spraymen were requested to wash their hands after spraying. Prior to spraying all the residents, pet animals and birds were evacuated from the house.

Thirty four houses (9.0%) out of 378 houses in Area A. and 59 (13.4%) out of 440 houses in Area B refused the spraying with the overall rate of 11.4% (93/818). The spraying started at approximately 8.30 a.m. every morning, and ended at 11.30 a.m. or 12.30 p.m. In Area A, 5.7 litres of OMS–33 were sprayed, while 6.8 litres of OMS–1197 sprayed in Area B. Insecticide sprayed per house was 16.5 ml for OMS–33, compared to 17.8 ml for OMS–1197, which was equivalent to 677 ml/ha and 600 ml/ha, respectively.

No complaint was received from the inhabitants and no sign of intoxication was observed among the scouts involved in the spraying operation.

EVALUATION METHODS

Effectiveness of treatments was evaluated by three methods: (1) landing rates, (2) visual larval surveys and (3) bioassay with *Culex quinquefasciatus*. Adult landing rates and visual larval surveys were made three weeks before the treatment and continued for one month after the treatment. Bioassay was made during the treatment, using adults and larvae, and air-borne bioassays were done twice after the treatment.

Landing rates: A team of five to six scouts collected all the mosquitoes landing on their legs in 40 – 48 houses in the area, spending 15 minutes in each house during the morning hours from 8.30 to 11.00.

Visual larval surveys: In a sample of about 50 houses, all the water containers were examined for the presence or absence of *Aedes* larvae. Preliminary observations in the trial areas confirmed that *Ae. aegypti* was the only species of *Aedes* breeding in water containers. On the basis of this survey, the Breteau Index, or number of positive containers per 100 houses, was calculated.

Bioassay: Adult bioassay was conducted by placing 20 unfed 3–4 days old *Cx. quinquefasciatus* females in a small

cage. One cage was hung down from the ceiling in every 10 houses in Area A and 13 houses of Area B prior to the treatment and left there for four hours. Additional seven cages were used as controls. The bioassay was also conducted twice after treatment to assess the possible air-borne effects of the treated insecticides, by hanging the cages in the treated houses for 4 hours. Larval bioassay to determine any possible larvicidal effect of the aerosol was carried out by placing 30 third instar *Cx. quinquefasciatus* larvae in each of the eight 500 ml plastic jars prior to the treatment. In all the tests, mortality count was taken after 24 hours.

RESULTS

Landing rates: In the area treated with OMS–33, the density of females dropped to nil on day 4, but returned to the pre-control level on day 7 (Table 1). In the area treated with OMS–1197, the adult density declined to zero up to day 10, threreafter it increased gradually, but was still lower than the pre-control level until day 29, the last observation. In the untreated check area, no marked increase or decrease of landing rates was observed during the whole trial period, although daily fluctuation was considerable.

Tabel 1. Adult density of *Ae aegypti* before and after cold aerosol treatment of OMS –33 and OMS –1197 in Kampung Ambon, Jakarta.

Before and after treatment Week	Day	Female density (No. per man hour)			House index of adult *Ae. aegypti*		
		A*	B*	C*	A*	B*	C*
Before							
5	29		0.42	0.67		8.3	22.9
4	23		0.75			27.0	
3	21	0.08		0.60	10.4		15.0
	15		0.75			18.8	
2	14	0.20		0.20	10.0		4.2
	8		0.75			14.6	
1	7	0.42		0.17	12.5		10.4
After							
1	3		0			0	
	4	0			0		
	6		0			0	
	7	0.25		0.42	10.4		22.9
2	10	0.10	0		7.5	0	
	14	0.58	0.25	1.20	25.0	6.2	12.5
3	17	0.40			12.5		
	21	0.33	0.20	0.50	20.8	5.0	12.5
5	29	0.50	0.08	0.33	10.4	2.0	16.7

Note : * A : Area A, OMS–33 treated area
B : Area B, OMS–1197 treated area
C : Area C, Untreated check area.

Visual larval survey: After treatment with OMS–33, there was no marked reduction in Breteau Indices (Table 2). After treatment with OMS–1197, the Breteau Index on day 10 was in the same level as pre-control, but thereafter it decreased. The indices determined on day 16 to day 30 were rather low, but the effect of the treatment on larval density was found to be negligible.

Adult bioassay: Mortality of mosquitoes obtained by exposing to aerosol was 97.0%. (192/198) in the OMS–33 treated area, compared to 100% (260/260) in the OMS–1197 treated area. In air–borne bioassay done in the OMS–33 treated houses, mortality was 8.6% (12/140) on day 3–4 and 2.5% on day 6–7. In the OMS–1197 treated houses, mortality was 36.6% (34/93) on day 2–3, and 1.9% (3/159) on day 7–8. The overall mortality of control cages during the whole test period was 6.7% (14/210).

Larval bioassay : Mortality of larvae exposed to aerosol was 76.7% (220/287) in the

Table 2. Breteau Index of *Ae.aegypti* before and after cold aerosol treatment of OMS–33 and OMS–1197 in Kampung Ambon, Jakarta.

Before and after treatment Week	Day	A OMS–33 treated area	B OMS–1197 treated area	C Untreated check area
Before				
4	26		23.0	19.0
	24	38.0		
3	19		8.0	
	17	13.0		54.0
2	12		6.2	
	10	20.8		12.5
1	5		12.5	
	3	12.5		8.3
After				
2	9		14.0	
	11	12.0		38.0
3	16		4.1	
	18	18.0		8.0
4	23		8.0	
	25	12.0		24.0
5	30		8.0	
	32	10.0		36.0

OMS–33 treated area; and 100% (169/169) in the OMS–1197 treated area. The control mortality was nil (0/180).

DISCUSSION

Pant et al.[2] reported that two treatments of technical malathion (96%) at three days interval by a vehicle-mounted Leco cold aerosol generator at a dosage of 438 ml/ha reduced *Ae.aegypti* population by 99%. Pant et al.[3] found that five sequential treatments of fenitrothion ULV aerosol (cold fog) applied by Leco al 11–49 days intervals at 511–1095 ml/ha gave a 4–5 month control of *Ae. Aegypti* Samutrapongse and Pant[7] carried out six applications of sumithion ULV aerosols by Fontan at 856–1364 ml/ha at 13–69 days intervals. They reported a very high degree of control was maintained for 7–8 months.

Direct comparison of the effects of either OMS–33 or OMS–1197 application with that of malathion or fenitrothion is rather difficult, because in those studies two or more applications were made while in the present studies only a single application was made. Nevertheless, single application of OMS–1197 at a dosage of 17.8 ml per house or 600 ml/ha was highly effective against *Ae.Aegypti* for 10 days, and low density continued for one month. Based on the results presented herewith, OMS–1197 could also be used for the control of *Ae.aegypti* in case of DF/DHF outbreaks. OMS–33 was apparently less effective than OMS–1197.

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